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Students reinvent the Fleet

Monterey, California, Naval Postgraduate School

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With the tightening of defense budgets at the end of the Cold War, the number of active Navy ships has declined over 40 percent in less than a decade. But with that level approaching a limit, increased emphasis has been placed on reducing crew levels in the remaining Fleet.

In 1996, a "Smart Ship" program was initiated, in which a small number of 'test-bed' ships were upgraded with technical innovations that allow for reduced manning. After much 'reshaping,' however, the first "Smart Ship," USS Yorktown (CG 48), has been able to reduce its crew level relative to other cruisers by only 15 percent. The Navy's goal for 2020 is over four times that much - a 70 percent reduction in manning over current crew levels for a comparable surface combatant, from 360 to about 100. Such drastically reduced manning targets will clearly not be met by 'reshaping' existing ships, even if the innovations are applied Fleet wide. Realistically, they can only be met by designing completely new surface ships "from 'the keel up," taking maximum advantage of productivity gains afforded by advanced information technology. Seeing this clearly, the Naval Postgraduate School responded to the challenge.

In the NPS Total Ship Systems Engineering (TSSE) program, officer students design entire 'future' ships to meet specific Navy needs. Initiated in 1991 by Director and Mechanical Engineering Professor Charles Calvano (Captain USN, Ret.), the curriculum is sponsored by the Naval Sea Systems Command - the Navy activity responsible for the design and procurement of all Navy ships, including their combat and weapons systems. Its mission is to provide a broad-based, design-oriented education focusing on the warship as a total engineering system, including the hull and mechanical, electrical and combat systems. Working in interdisciplinary teams, students from Mechanical Engineering, Electrical Engineering and Combat Systems/Physics use the Navy's Advanced Surface Ship Evaluation Tool, an early-stage design program, to reinvent the future Fleet. A TSSE graduate, Lt. David Ruley, did the artist's conception of the 'imaginary' multi-capable surface combatant on page 1.

"An interdisciplinary systems approach is absolutely essential to ensure that ships' weapons and sensors are fully integrated with the mechanical and electrical systems that support them, that subsystems don't work at cross purposes to one another, that design trade-offs are optimized, and that the overall ship design is as broad-based and versatile as possible and still meets the Navy's specifications," Calvano said. "Our future ships must be survivable yet versatile, because we don't know what the next threat will be."

Students' Total Ship designs have been briefed to the Assistant Secretary of the Navy for Research, Development and Acquisition, and a number of TSSE graduates now play key roles in the Navy's ship acquisition programs.

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